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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,242	05/08/2001	Charles J. Runkle	2000.16	4003

29494 7590 03/17/2006

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
1732	

DATE MAILED: 03/17/2006

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/851,242
Filing Date: May 08, 2001
Appellant(s): RUNKLE ET AL.

Scott E. Hanf
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 4, 2006 appealing from the Office action mailed July 28, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,186,832	MANCUSI et al.	02-1993
4,800,019	BIKSON et al.	01-1989
5,284,584	HUANG et al.	02-1994
4,961,760	CASKEY et al.	10-1990
JP 11-169676	MARUI et al.	06-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

A. Claims 1, 16 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 11-169676.

Regarding claim 1, JP 11-169676 teaches the claimed process of making a hollow fiber membrane separation device (contactor) including, wrapping a hollow fiber fabric onto a core (winding), potting the fabric and the core together to form an assembly (first potting), placing the assembly in a housing (shell), providing molds (14, 15), positioning the ends of the plurality of hollow fiber bundles into the molds and injecting a resinous material (thermosetting or thermoplastic material) into the mold to form an integrated structure with the housing (cartridge) (see paragraph [0026]).

In regard to claim 16, JP 11-169676 teaches a resinous material, hence teaching a thermoplastic or a thermosetting material.

Specifically regarding claim 19, JP 11-169676 teaches placing the assembly in a housing (shell) to form a hollow fiber membrane separation device (contactor). It is submitted that said

assembly must be centered in order for the resulting hollow fiber membrane separation device (contactor) to function as described.

B. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Mancusi *et al.* (US Patent No. 5,186,832).

JP 11-169676 teaches the basic claimed process as described above.

Regarding claim 2, JP 11-169676 does not each bead potting. Mancusi *et al.* ('832) teach a process for making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core (winding), potting the fabric and the core together to form an assembly (first potting), placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (second potting) (see col. 8, lines 44-48, col. 9, lines 1-7 and 60-68 and col. 9, lines 41-60). Further, it should be noted that Mancusi *et al.* ('832) specifically teach potting of the tube-sheets to the interior of the housing (see col. 9, lines 22-27). Furthermore, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50). Therefore, it would have been obvious for one of ordinary skill in the art to have used bead potting as taught by Mancusi *et al.* ('832) in the process of JP 11-169676 because, JP 11-169676 teaches a two potting process, whereas Mancusi *et al.* ('832) teach that in a two potting step process the first potting step is a bead potting step, hence providing for an improved and, a more efficient, process and also because, both references teach similar processes and end-products.

C. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Caskey *et al.* (US Patent No. 4,961,760).

JP 11-169676 teaches the basic claimed process as described above.

Regarding claims 17-18, although JP 11-169676 teaches a resinous potting material, JP 11-169676 does not teach specific materials. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of JP 11-169676 because, JP 11-169676 specifically requires a resinous potting materials, whereas Caskey *et al.* ('760) teach that resinous materials such as epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) provide for an improved product and also because, all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product that requires similar potting materials.

D. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Bikson *et al.* (US Patent No. 4,800,019).

JP 11-169676 teaches the basic claimed process as described above.

Regarding claims 4-5, JP 11-169676 does not teach a heat-treating step, specifically a first and a second heat-treatment. Bikson *et al.* ('019) teach a process for forming a hollow fiber

membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of JP 11-169676 because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, both references teach similar end-products.

E. Claims 21, 24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Applicants' Admitted Prior Art.

JP 11-169676 teaches the basic claimed process as described above.

Regarding claim 21, JP 11-169676 does not teach a hollow fiber membrane having a diameter of at least 6 inches. However, Applicants' Admitted Prior Art teaches a hollow fiber membrane having a diameter of about 10 inches (see page 2, line 9 of the original disclosure). Therefore, it would have been obvious for one of ordinary skill in the art to have formed a hollow fiber membrane having a diameter of about 10 inches by using a center tube having a diameter of about 10 inches as taught by Applicants' Admitted Prior Art using the process of JP 11-169676 because, Applicants' Admitted Prior Art specifically teaches that such hollow fiber membrane are readily available whereas JP 11-169676 teach a hollow fiber membrane separation device (contactor), hence a similar end-product and also because JP 11-169676 teaches an efficient and simple process for making a hollow fiber membrane.

In regard to claim 24, JP 11-169676 teaches a resinous material, hence teaching a thermoplastic or a thermosetting material.

Specifically regarding claim 27, JP 11-169676 teaches placing the assembly in a housing (shell) to form a hollow fiber membrane separation device (contactor). It is submitted that said assembly must be centered in order for the resulting hollow fiber membrane separation device (contactor) to function as described.

F. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Applicants' Admitted Prior Art and in further view of Bikson *et al.* (US Patent No. 4,800,019).

JP 11-169676 in view of Applicants' Admitted Prior Art teaches the basic claimed process as described above.

Regarding claims 22-23, JP 11-169676 in view of Applicants' Admitted Prior Art does not teach a heat-treating step, specifically a first and a second heat-treatment. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of JP 11-169676 in view of Applicants' Admitted Prior Art because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, both references teach similar end-products.

G. Claims 25 and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-169676 in view of Applicants' Admitted Prior Art and in further view of Caskey *et al.* (US Patent No. 4,961,760).

JP 11-169676 in view of Applicants' Admitted Prior Art teaches the basic claimed process as described above.

Regarding claims 25-26, although JP 11-169676 teaches a resinous potting material, JP 11-169676 does not teach specific materials. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of JP 11-169676 in view of Applicants' Admitted Prior Art because, JP 11-169676 specifically requires a resinous potting materials, whereas Caskey *et al.* ('760) teach that resinous materials such as epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) provide for an improved product and also because, all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product that requires similar potting materials.

H. Claims 1-2, 4-5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of Bikson *et al.* (US Patent No. 4,800,019).

Mancusi *et al.* ('832) teach the basic claimed process of making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core (winding), potting the fabric and the core together to form an assembly (first potting), placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (second potting) (see col. 8, lines 44-48, col. 9, lines 1-7 and 60-68 and col. 9, lines 41-60). Further, it should be noted that Mancusi *et al.* ('832) specifically teach potting of the tube-sheets to the interior of the housing (see col. 9, lines 22-27). Furthermore, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50).

Regarding claim 1, although Mancusi *et al.* ('832) teach a second potting step, Mancusi *et al.* ('832) do not specifically teach mold potting. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor cartridge including, providing a mold, inserting the ends of a plurality of hollow fiber (3) bundles into the mold and injecting a resinous material into the mold to form tube-sheets (1) that are integral with the housing (see col. 4, lines 48-68). Therefore, it would have been obvious for one of ordinary skill in the art to have used mold potting as an alternative to gravity or centrifugal potting as taught by Bikson *et al.* ('019) in the process of Mancusi *et al.* ('832) because, Bikson *et al.* ('019) teach that mold potting is one of many equivalent procedures available to one ordinarily skilled in the art and also because, both references teach similar products and processes and solve the similar problem of potting in a process of making a hollow fiber membrane separation device (contactor). It is submitted that a space must exist between the exterior of the fiber bundles and, the mold and the housing, in order

for the resin to penetrate between said spaces, such that mold potting occurs as described in the process of Mancusi *et al.* ('832) in view of Bikson *et al.* ('019).

In regard to claim 2, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50).

Specifically regarding claims 4 and 5, Mancusi *et al.* ('832) does not teach a step of heat-treatment, specifically a first and a second heat-treatment. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of Mancusi *et al.* ('832) because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, both references teach similar end-products.

Regarding claim 19, Mancusi *et al.* ('832) specifically teach a hollow fiber membrane separation device (contactor). It is submitted that the assembly (structure) is centered in the housing (shell) in order for the resulting hollow fiber membrane separation device (contactor) to function as described.

I. Claims 1-2 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676.

Mancusi *et al.* ('832) teach the basic claimed process of making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core (winding), potting the fabric and the core together to form an assembly (first potting), placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (second potting) (see col. 8, lines 44-48, col. 9, lines 1-7 and 60-68 and col. 9, lines 41-60). Further, it should be noted that Mancusi *et al.* ('832) specifically teach potting of the tube-sheets to the interior of the housing (see col. 9, lines 22-27). Furthermore, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50).

Regarding claims 1-2, although Mancusi *et al.* ('832) teach a second potting step, Mancusi *et al.* ('832) do not specifically teach mold potting. JP 11-169676 teaches the claimed process of making a hollow fiber membrane separation device (contactor) including, wrapping a hollow fiber fabric onto a core (winding), potting the fabric and the core together to form an assembly (first potting), placing the assembly in a housing (shell), providing molds (14, 15), positioning the ends of the plurality of hollow fiber bundles into the molds and injecting a resinous material (thermosetting or thermoplastic material) into the mold to form an integrated structure with the housing (cartridge) (see paragraph [0026]). Therefore, it would have been obvious for one of ordinary skill in the art to have used mold potting as taught by JP 11-169676 in the process of Mancusi *et al.* ('832) because, JP 11-169676 specifically teach that mold potting is an efficient process for potting a hollow fiber membrane separation device, and also because, all references teach similar products and processes and solve the similar problem of

potting in a process of making a hollow fiber membrane separation device (contactor). It is submitted that a space must exist between the exterior of the fiber bundles and, the mold and the housing, in order for the resin to penetrate between said spaces, such that mold potting occurs as described in the process of Mancusi *et al.* ('832) in view of by JP 11-169676.

In regard claim 19, Mancusi *et al.* ('832) specifically teach a hollow fiber membrane separation device (contactor). It is submitted that the assembly (structure) is centered in the housing (shell) in order for the resulting hollow fiber membrane separation device (contactor) to function as described.

J. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676 and in further view of Bikson *et al.* (US Patent No. 4,800,019).

Mancusi *et al.* ('832) in view of JP 11-169676 teach the basic claimed process as described above.

Regarding claims 4-5, Mancusi *et al.* ('832) in view of by JP 11-169676 does not teach a step of heat-treatment, specifically a first and a second heat-treatment. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of Mancusi *et al.* ('832) in view of by JP 11-169676 because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the

hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, all references teach similar end-products.

K. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of Bikson *et al.* (US Patent No. 4,800,019) and in further view of Caskey *et al.* (US Patent No. 4,961,760).

Mancusi *et al.* ('832) in view of Bikson *et al.* ('019) teach the basic claimed process as described above.

Regarding claims 16-18, although Mancusi *et al.* ('832) teach "resinous potting materials" (see col. 9, lines 10-12), Mancusi *et al.* in view of ('832) Bikson *et al.* ('019) do not teach specific materials. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of Mancusi *et al.* ('832) in view of Bikson *et al.* ('019) because, Mancusi *et al.* ('832) specifically requires "resinous potting materials" (see col. 9, lines 10-12) and also because all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

L. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676 and in further view of Caskey *et al.* (US Patent No. 4,961,760).

Mancusi *et al.* ('832) in view of JP 11-169676 teach the basic claimed process as described above.

Regarding claims 16-18, although Mancusi *et al.* ('832) teach "resinous potting materials" (see col. 9, lines 10-12), Mancusi *et al.* in view of JP 11-169676 do not teach specific materials. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of Mancusi *et al.* ('832) in view of JP 11-169676 because, Mancusi *et al.* ('832) specifically requires "resinous potting materials" (see col. 9, lines 10-12) and also because all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

M. Claims 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art.

Mancusi *et al.* ('832) in view of JP 11-169676 teach the basic claimed process as described above.

Regarding claim 21, Mancusi *et al.* ('832) in view of JP 11-169676 does not teach a hollow fiber membrane having a diameter of at least 6 inches. However, Applicants' Admitted Prior Art teaches a hollow fiber membrane having a diameter of about 10 inches (see page 2, line 9 of the original disclosure). Therefore, it would have been obvious for one of ordinary skill in the art to have formed a hollow fiber membrane having a diameter of about 10 inches by using a center tube having a diameter of about 10 inches as taught by Applicants' Admitted Prior Art using the process of Mancusi *et al.* ('832) in view of JP 11-169676 because, Applicants' Admitted Prior Art specifically teaches that such hollow fiber membrane are readily available whereas Mancusi *et al.* ('832) in view of JP 11-169676 teach a hollow fiber membrane separation device (contactor), hence a similar end-product and also because Mancusi *et al.* ('832) in view of JP 11-169676 teaches an efficient and simple process for making a hollow fiber membrane.

Specifically regarding claim 27, Mancusi *et al.* ('832) specifically teach a hollow fiber membrane separation device (contactor). It is submitted that the assembly (structure) is centered in the housing (shell) in order for the resulting hollow fiber membrane separation device (contactor) to function as described.

N. Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art and Bikson *et al.* (US Patent No. 4,800,019).

Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art teach the basic claimed process as described above.

Regarding claims 22 and 23, Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art does not teach a step of heat-treatment, specifically a first and a second heat-treatment. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, all references teach similar end-products.

O. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancusi *et al.* (US Patent No. 5,186,832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art and Caskey *et al.* (US Patent No. 4,961,760).

Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art teach the basic claimed process as described above.

Regarding claims 24-26, although Mancusi *et al.* ('832) teach "resinous potting materials" (see col. 9, lines 10-12), Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art do not teach specific materials. Caskey *et al.* ('760)

teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of Mancusi *et al.* ('832) in view of JP 11-169676 and in further view of Applicants' Admitted Prior Art because, Mancusi *et al.* ('832) specifically requires "resinous potting materials" (see col. 9, lines 10-12) that are equivalent alternatives such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) and also because all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

P. Claims 1-2, 4-5, 16, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang *et al.* (US Patent No. 5,284,584) in view of Mancusi *et al.* (US Patent No. 5,186,832) and in further view of Bikson *et al.* (US Patent No. 4,800,019).

Huang *et al.* ('584) teach the basic claimed process for making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core and potting the fabric and the core together to form an assembly (see col. 15, line 57, through col. 16, line 26). Further, Huang *et al.* ('584) teach bead-potting (see Figure 1).

Regarding claim 1, Huang *et al.* ('584) do not teach forming a cartridge. Mancusi *et al.* ('832) teach a process for making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core, potting the fabric and

the core together to form an assembly, placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (see col. 8, lines 44-48, col. 9, lines 1-7 and 60-68 and col. 9, lines 41-60). Further, it should be noted that Mancusi *et al.* ('832) specifically teach potting of the tubesheets to the interior of the housing (see col. 9, lines 22-27). Furthermore, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50). Therefore, it would have been obvious for one of ordinary skill to have inserted a hollow fiber membrane device into a casing and potted said hollow fiber membrane device to said casing as taught by Mancusi *et al.* ('832) in the process of Huang *et al.* ('584) because, Huang *et al.* ('584) specifically teach a hollow fiber membrane fabric used in separation devices, whereas Mancusi *et al.* ('832) teach a hollow fiber membrane separation devices and as such, the hollow fiber membrane fabric of Huang *et al.* ('584) requires to be inserted into a casing and potted to said casing as taught by Mancusi *et al.* ('832) in order to function as described.

Further regarding claim 1 and in regard to claim 20, although Mancusi *et al.* ('832) teach a second potting step, Huang *et al.* ('584) in view of Mancusi *et al.* ('832) do not specifically teach mold potting. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor cartridge including, providing a mold, inserting the ends of a plurality of hollow fiber (3) bundles into the mold and injecting a resinous material into the mold to form tube-sheets (1) that are integral with the housing (see col. 4, lines 48-68). Therefore, it would have been obvious for one of ordinary skill in the art to have used mold potting as an alternative to gravity or centrifugal potting as taught by Bikson *et al.* ('019) in the process of Huang *et al.* ('584) in view

of Mancusi *et al.* ('832) because, Bikson *et al.* ('019) teach that mold potting is one of many equivalent procedures available to one ordinarily skilled in the art and also because, all references teach similar products and processes and solve the similar problem of potting in a process of making a hollow fiber membrane separation device (contactor). It is submitted that a space must exist between exterior of the fiber bundles and, the mold and the housing, in order for the resin to penetrate between said space, such that mold potting occurs as described in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019).

In regard to claim 2, Huang *et al.* ('584) teach bead-potting (see Figure 1). Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50).

Specifically regarding claims 4 and 5, Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, both references teach similar end-products.

Regarding claims 16 and 18, Huang *et al.* ('584) teach a thermoplastic polyolefin as a potting material (see col. 11, lines 32-47).

In regard to claim 19, Huang *et al.* ('584) specifically teach a hollow fiber membrane fabric used in separation devices, whereas Mancusi *et al.* ('832) teaches hollow fiber membrane separation devices. It is submitted that the assembly (structure) is centered in the housing (shell) in order for the resulting hollow fiber membrane separation device (contactor) to function as described in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019).

Q. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang *et al.* (US Patent No. 5,284,584) in view of Mancusi *et al.* (US Patent No. 5,186,832) and in further view of Bikson *et al.* (US Patent No. 4,800,019) and Caskey *et al.* (US Patent No. 4,961,760).

Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) teaches the basic claimed process as described above.

Regarding claim 17, Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) do not teach an epoxy or a polyurethane potting material. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of equivalent materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of equivalent potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the

process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) because, Mancusi *et al.* ('832) specifically requires "resinous potting materials" (see col. 9, lines 10-12) that are equivalent alternatives such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) and also because all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

R. Claims 21-24 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang *et al.* (US Patent No. 5,284,584) in view of Mancusi *et al.* (US Patent No. 5,186,832) and in further view of Bikson *et al.* (US Patent No. 4,800,019) and Applicants' Admitted Prior Art.

Huang *et al.* ('584) teach the basic claimed process for making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core and potting the fabric and the core together to form an assembly (see col. 15, line 57 through col. 16, line 26). Further, Huang *et al.* ('584) teach bead-potting (see Figure 1).

Regarding claim 21, Huang *et al.* ('584) do not teach forming a cartridge. Mancusi *et al.* ('832) teach a process for making a hollow fiber membrane separation device (contactor) including, providing a core, wrapping a hollow fiber fabric onto said core, potting the fabric and the core together to form an assembly, placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (see col. 8, lines 44-48, col. 9, lines 1-7 and 60-68 and col. 9, lines 41-60). Further, it should be noted that Mancusi *et al.* ('832) specifically teach potting of the tubesheets to the interior of the housing (see col. 9, lines 22-27). Furthermore, Mancusi *et al.* ('832) teach that the potting between the fabric and the core occurs

by putting down continuous resinous potting material lines (bead-potting) (see col. 10, lines 45-50). Therefore, it would have been obvious for one of ordinary skill to have inserted a hollow fiber membrane device into a casing and potted said hollow fiber membrane device to said casing as taught by Mancusi *et al.* ('832) in the process of Huang *et al.* ('584) because, Huang *et al.* ('584) specifically teach a hollow fiber membrane fabric used in separation devices, whereas Mancusi *et al.* ('832) teach hollow fiber membrane separation devices and as such, the hollow fiber membrane fabric of Huang *et al.* ('584) requires to be inserted into a casing and potted to said casing as taught by Mancusi *et al.* ('832) in order to function as described.

Further regarding claim 21 and in regard to claim 28, although Mancusi *et al.* ('832) teach a second potting step, Huang *et al.* ('584) in view of Mancusi *et al.* ('832) do not specifically teach mold potting. Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor cartridge including, providing a mold, inserting the ends of a plurality of hollow fiber (3) bundles into the mold and injecting a resinous material into the mold to form tube-sheets (1) that are integral with the housing (see col. 4, lines 48-68). Therefore, it would have been obvious for one of ordinary skill in the art to have used mold potting as an alternative to gravity or centrifugal potting as taught by Bikson *et al.* ('019) in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) because, Bikson *et al.* ('019) teach that mold potting is one of many equivalent procedures available to one ordinarily skilled in the art and also because, all references teach similar products and processes and solve the similar problem of potting in a process of making a hollow fiber membrane separation device (contactor). It is submitted that a space must exist between exterior of the fiber bundles and, the mold and the housing, in order for

the resin to penetrate between said space such that mold potting occurs as described in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019).

Further regarding claim 21, Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) do not teach a hollow fiber membrane having a diameter of at least 6 inches. However, Applicants' Admitted Prior Art teaches a hollow fiber membrane having a diameter of about 10 inches (see page 2, line 9 of the original disclosure). Therefore, it would have been obvious for one of ordinary skill in the art to have formed a hollow fiber membrane having a diameter of about 10 inches by using a center tube having a diameter of about 10 inches as taught by Applicants' Admitted Prior Art using the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) because, Applicants' Admitted Prior Art specifically teaches that such hollow fiber membrane are readily available whereas Huang *et al.* ('584), Mancusi *et al.* ('832) and Bikson *et al.* ('019) teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

In regard to claims 22-23, Bikson *et al.* ('019) teach a process for forming a hollow fiber membrane contactor including, a first step of heat-treating to cure the potting resin and then a second step of heat treatment (see col. 4, line 60 through col. 5, line 7). Therefore, it would have been obvious for one of ordinary skill in the art to have heat-treated the hollow fiber membrane contactor as taught by Bikson *et al.* ('019) in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Applicants' Admitted Prior Art because, Bikson *et al.* ('019) specifically teach that a two-step heat treatment process provides for an increased

density of the porous walls of the hollow fibers, hence providing for an improved product (see col. 3, lines 27-42) also because, both references teach similar end-products.

Regarding claims 24 and 26, Huang *et al.* ('584) teach a thermoplastic polyolefin as a potting material (see col. 11, lines 32-47).

In regard to claim 27, Huang *et al.* ('584) specifically teach a hollow fiber membrane fabric used in separation devices, whereas Mancusi *et al.* ('832) teaches hollow fiber membrane separation devices. It is submitted that the assembly (structure) is centered in the housing (shell) in order for the resulting hollow fiber membrane separation device (contactor) to function as described in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) and Applicants' Admitted Prior Art.

S. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang *et al.* (US Patent No. 5,284,584) in view of Mancusi *et al.* (US Patent No. 5,186,832) and in further view of Bikson *et al.* (US Patent No. 4,800,019), Applicants' Admitted Prior Art and Caskey *et al.* (US Patent No. 4,961,760).

Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) and Applicants' Admitted Prior Art teach the basic claimed process as described above. Regarding claim 25, Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) and Applicants' Admitted Prior Art do not teach an epoxy or a polyurethane potting material. Caskey *et al.* ('760) teach a process for making a hollow fiber membrane separation device (contactor) including, using a variety of materials as potting materials such as: epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins

(thermoplastic). Therefore, it would have been obvious for one of ordinary skill in the art to have used a variety of potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) as taught by Caskey *et al.* ('760) in the process of Huang *et al.* ('584) in view of Mancusi *et al.* ('832) and in further view of Bikson *et al.* ('019) and Applicants' Admitted Prior Art because, Huang *et al.* ('584) specifically requires "resinous potting materials" that are equivalent alternatives such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic) and also because all references teach a hollow fiber membrane separation device (contactor), hence a similar end-product.

(10) Response to Appellants' Arguments

A. Appellants argue that JP 11-169676 does not teach a two-step potting process because JP 11-169676 teaches that "both ends of the hollow fiber membrane bundle group are permeated, which means that no tube sheet" (see pages 9-19 and 26-38 of the Appeal Brief filed January 4, 2006). In response, it is noted that JP 11-169676 teaches a first potting step of "sealing part of the space, separated by the wavy sheet and the flat sheet with resin" and then, in a second step, sealing the ends of the rolled hollow fiber membrane using molds (14, 15) installed on both ends (see paragraph [0026]). Hence, it is submitted that JP 11-169676 teaches a two-step potting process.

B. In response to appellants' argument that there is no suggestion to combine the teachings of JP 11-169676 with the teachings of Mancusi *et al.* ('832), Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art (see pages 1-19 of the Appeal Brief filed

January 4, 2006), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Mancusi *et al.* ('832), Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art all teach similar end-products, materials or processes. Specifically, Mancusi *et al.* ('832) teach providing an improved process of making a hollow fiber membrane separation device (contactor) by bead potting. Caskey *et al.* ('760) teach providing an improved process of making a hollow fiber membrane separation device (contactor) by using potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic versions) and acrylic resins (thermoplastic). Bikson *et al.* ('019) teach providing an improved process of making a hollow fiber membrane separation device (contactor) by providing a first step of heat-treating to cure the potting resin and then a second step of heat treatment. Applicants' Admitted Prior Art teaches a hollow fiber membrane having a diameter of about 10 inches. Therefore, it would have been obvious for one of ordinary skill in the art to modify the process JP 11-169676 using the teachings of Mancusi *et al.* ('832), Caskey *et al.* ('760), Bikson *et al.* ('019) or respectively, Applicants' Admitted Prior Art because, Mancusi *et al.* ('832), Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art all teach providing an improved process of making a hollow fiber membrane separation device (contactor) and also because all references teach similar end-products, materials and processes.

C. Appellants argue that Mancusi *et al.* ('832) do not teach a two-step potting process (see pages 11-12 and 20-38 of the of the Appeal Brief filed January 4, 2006). In response, it is noted that as shown throughout prosecution of the instant application iot has been shown that Mancusi *et al.* ('832) teach a process for making a hollow fiber membrane separation device (contactor) including a first potting step of potting the fabric and the core together to form an assembly (first potting) and then in a second potting step, potting the assembly and a housing interior to form a cartridge (see col. 10, lines 42-57).

D. In response to appellants' argument that there is no suggestion to combine the teachings of Mancusi *et al.* ('832) with the teachings of JP 11-169676, Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art (see pages 21- 38 of the Appeal Brief filed January 4, 2006), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, JP 11-169676, Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art all teach similar end-products, materials or processes. Specifically, JP 11-169676 teach providing an improved process of making a hollow fiber membrane separation device (contactor) by mold potting. Caskey *et al.* ('760) teach providing an improved process of making a hollow fiber membrane separation device (contactor) by using potting materials such as, epoxy (thermoset), polyurethane (thermoset and thermoplastic

versions) and acrylic resins (thermoplastic). Bikson *et al.* ('019) teach providing an improved process of making a hollow fiber membrane separation device (contactor) by providing a first step of heat-treating to cure the potting resin and then a second step of heat treatment. Applicants' Admitted Prior Art teaches a hollow fiber membrane having a diameter of about 10 inches. Therefore, it would have been obvious for one of ordinary skill in the art to modify the process Mancusi *et al.* ('832) using the teachings of JP 11-169676, Caskey *et al.* ('760), Bikson *et al.* ('019) or respectively, Applicants' Admitted Prior Art because, JP 11-169676, Caskey *et al.* ('760), Bikson *et al.* ('019) and Applicants' Admitted Prior Art all teach providing an improved process of making a hollow fiber membrane separation device (contactor) and also because all references teach similar end-products, materials and processes.

(10) Response to BPAI Arguments of January 27, 2005

The Board of Patent Appeals and Interferences (hereinafter the "Board") argues that the "examiner appears to have confusingly referred to portions of several separate options for forming a cartridge disclosed in the patent without fully explaining how each of those separate embodiments of Mancusi considered alone, or in combination with Bikson, teach or suggest the claimed process including two potting steps" (see pages 3-4 of the BPAI Arguments of January 27, 2005). The Board further states that the "examiner should determine whether or not that sealing step in forming the cast-in-place module corresponds to or would have suggested the claimed mold-potting step to one of ordinary skill in the art" and "[T]hen, the examiner, should further determine whether or not the bundle employed in making the cast-in-place module of Mancusi would have been understood by one of ordinary skill in the art as including a potted

bundle that was formed by winding a hollow fiber fabric around a tube and subsequent potting thereof as described above in Mancusi (column 8, line 44 through column 9, line 4)" (see pages 4-5 of the BPAI Arguments of January 27, 2005).

In response, it is noted that Mancusi *et al.* ('832) teaches both cast-in-place modules and pressure housing modules (see col. 9, lines 52-55). In respect to the cast-in-place modules, Mancusi *et al.* ('832) teaches providing a core, wrapping a hollow fiber fabric onto said core (winding), potting the fabric and the core together to form an assembly (first potting) using centrifugal or gravity casting, placing the assembly in a housing (shell) and potting the assembly and the housing interior to form a cartridge (second potting) (see col. 9, lines 1-7 and 18-27 and, col. 9, line 56 through col. 10, line 27). Further, in respect to the pressure housing modules, Mancusi *et al.* ('832) specifically teaches that the "same fabrication steps are carried out as for cast-in-place modules" (see col. 10, lines 6-10) with an exception for relatively large diameter cartridges. Regarding relatively large diameters, Mancusi *et al.* ('832) teaches that because of too much heat being released exothermically, potting of the fabric and the core together to form an assembly (first potting) cannot occur using centrifugal or gravity potting in which the fiber bundle is first rolled and then potted at the ends. As such, (first) potting occurs by simultaneously winding and end sealing in a single step by employing a continuous potting method. Subsequently, the sealed fiber bundle (first potting step) is then potted to the housing interior, hence forming a second potting step (see col. 10, lines 27-32 and 42-57). Hence, it is noted that Mancusi *et al.* ('832) teach a two-potting step process for making a large diameter hollow fiber membrane separation device (contactor).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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